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CHEVRON TEXACO CORPORATION
P.O. BOX 6006
SAN RAMON, CA 94583-0806

EXAMINER

TIBBITS, PIA FLORENCE

| ART UNIT | PAPER NUMBER |
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2838

DATE MAILED: 09/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/723,105

Applicant(s)

BAKER, HOWARD S.

Examiner

Pia F. Tibbits

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 June 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,5-17,20-38 and 41-49 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,5-17,20,22-38 and 41-49 is/are rejected.
- 7) ☒ Claim(s) 21 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

This Office action is in answer to the amendment filed 6/19/2006. Claims 1, 2, 5-17, 20-38, 41-49 are pending, of which claims 1, 15, 26, 35 are amended.

Claim Objections

1. Claim 21 is objected to because of the following informalities: it depends upon claim 19 canceled by this amendment. Accordingly claim 21 has not been further treated on the merits. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-49 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1-49 recite "wherein the power supply derives its power from the plurality of cells". To continue prosecution it was assumed that external power is provided at least at start up.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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5. Claims 1, 2, 5-17, 20, 22-38, 41-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Fuglevand et al.** [6387556] in view of **Fujimoto et al.** [6169279].

Fuglevand discloses a system for monitoring a plurality of cell voltages of a fuel cell stack having a plurality of cells connected in series, the system comprising:

(a) a plurality of connecting pins 20;

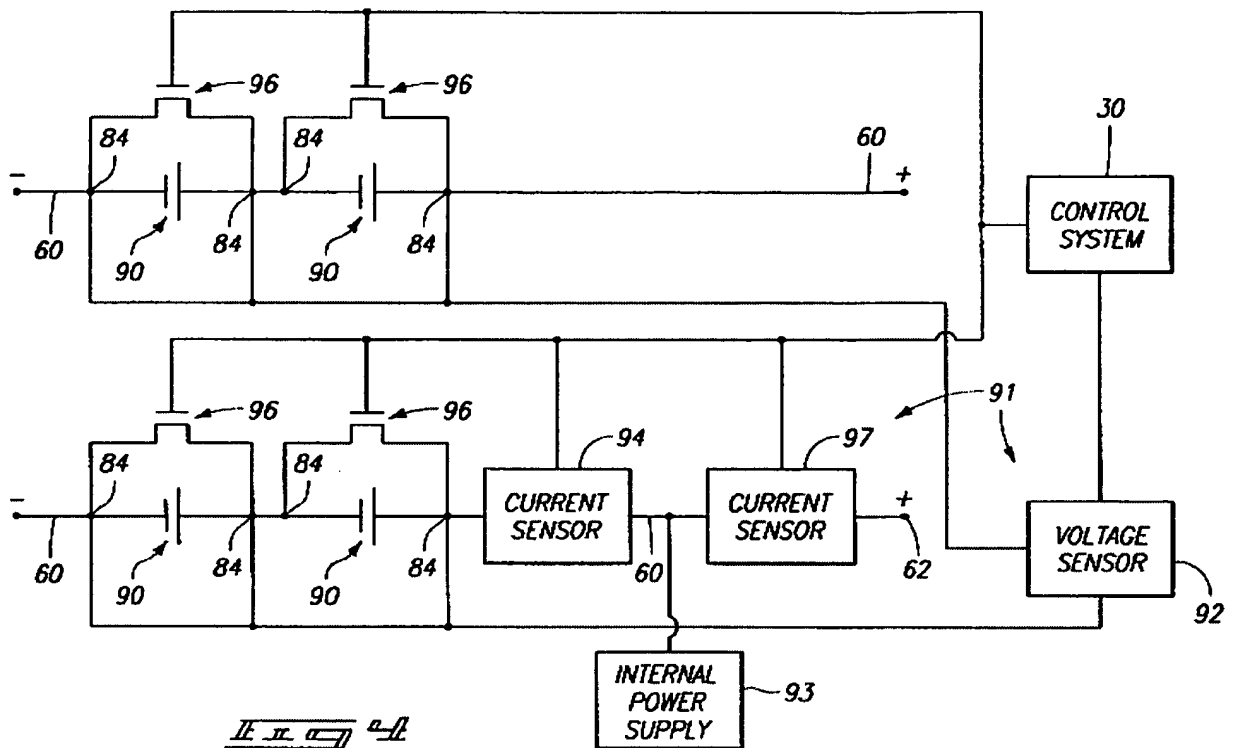
(b) a plurality of differential amplifiers 92 [see column 9, line 43]

(45) More specifically, analysis circuitry 91 includes a voltage sensor 92 which may be provided electrically coupled with contacts 84 as shown. Such coupling enables voltage sensor 92 to monitor the voltages of the individual respective fuel cells 90. Fuel cells 90 have been observed to typically produce a useful voltage of about 0.45 to about 0.7 volts DC under a typical load.

(46) An exemplary configuration of voltage sensor 92 is implemented as a differential amplifier for monitoring voltages. Voltage sensor 92 is preferably configured to monitor voltage magnitude across individual fuel cells 90 as well as polarity of individual fuel cells 90.

(c) a switch 96 having the input connected to the outputs of the differential amplifiers;

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(d) an analog to digital converter 30 having an input connected to the output of the switching network 96 and adapted to provide digital values indicative of the voltages measured by the plurality of differential amplifiers [see column 10, line 55];

(55) Referring to FIG. 5, one configuration of control system 30 is illustrated. In the depicted arrangement, control system 30 includes a distributed control system including a plurality of controllers 100-120. Individual controllers 100-120 comprise programmable microcontrollers in the described embodiment. Exemplary microcontrollers have trade designation MC68HC705P6A available from Motorola, Inc. In the described embodiment, controllers 100-120 individually comprise a controller configured to execute instructions provided within executable code. In an alternative configuration, the steps described with reference to FIGS. 16-28 below are implemented with hardware.

(56) Individual controllers can include random access memory (RAM), read only memory (ROM), analog-to-digital (A/D) converters, serial input/output port

and

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(e) a power supply 93 to supply regulated power to at least one electrical circuit consisting of the differential amplifiers and switching network, wherein after start up the power supply derives its power from the plurality of cells [see fig.5; column 9, lines 60-65].

Following start-up operations, power for internal use within fuel cell power system 10 (e.g., power provided to the circuitry of control system 30) is provided from fuel cell cartridges 14. Internal power supply 93 extracts current from bus 60 as shown to provide internal power to fuel cell power system 10.

As to the plurality of connecting pins being removable connection across the plurality of cells, Fuglevand discloses when describing fig.1:

fuel cell cartridges 14. Housing 12 defines a subrack assembly in the described embodiment.

(4) Fuel cell power system 10 is configured to utilize one or more of fuel cell cartridges 14. Twelve such fuel cell cartridges 14 are

so that, it is an inherent function of the system for monitoring a plurality of cell voltages of a fuel cell stack to have a removable connection across the plurality of cells, and MPEP 2100 states that the disclosure of a limitation may be expressed, implicit or **inherent**.

The instant specification does not describe the criticality of using a switching network, the switches having a plurality of inputs and one output, etc. and it merely repeats the claim language. "If the applicant has *not* demonstrated the criticality of a specific limitation, it would be appropriate to rely solely on case law as the rationale to support an obviousness rejection". See **MPEP 2144.04**.

As to the switches 96 being part of a switching network, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to make integral the switching system, since it has been held that forming in one piece an article which has formerly been formed in two pieces and put together involves only routing skill in the art. *In re Larson*, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965). See **MPEP 2144.04**.

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As to the switches 96 having a plurality of inputs and one output, absent any criticality, is only considered to be the use of "optimum" or "preferred" material that a person having ordinary skill in the art at the time the invention was made using routine experimentation would have found obvious to provide for the switches 96 disclosed by Fuglevand in order to accommodate a user specific application since it has been held to be a matter of obvious design choice and within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use of the invention. See *In re Leshin*, 125 USPQ 416. *In re Aller*, 105 USPQ 233 (CCPA 1955), *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

As to having not more than one analog to digital converter per 16 cells, absent any criticality, is only considered to be the use of "optimum" or "preferred" material that a person having ordinary skill in the art at the time the invention was made using routine experimentation would have found obvious to provide for the switches 96 disclosed by Fuglevand in order to accommodate a user specific application since it has been held to be a matter of obvious design choice and within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use of the invention. See *In re Leshin*, 125 USPQ 416. *In re Aller*, 105 USPQ 233 (CCPA 1955), *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

Fuglevand does not disclose each differential amplifier having a plurality of laser wafer trimmed resistors providing matching, so that common mode signals are rejected, while differential input signals are amplified, each differential amplifier having two inputs and one output, wherein the inputs are each connected to the plurality of connecting pins.

Fujimoto discloses an operational amplifier 32 for amplifying the potential an output including a gain-adjusting resistor R. The gain-adjusting resistor R comprises a plurality of resistors (Ra.sub.1, Ra.sub.2, Ra.sub.3, Ra.sub.4, Rb.sub.1, Rb.sub.2, Rb.sub.3, Rb.sub.4) and Rb4 connected in series and cuttable bypass wirings (50) provided to all or some of the plurality of resistors [see fig.5; abstract]. In order to have amplifier 32 yield the analog output level required by the customer, the output is calculated for the analog output available at this stage, and the bypass wiring 50 of the selected adjusting resistor is

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cut by laser cutting in order to establish the desired total resistance of the resistor group Ra and resistor group Rb. Such laser cutting may, for example, be readily accomplished by scanning an excimer laser beam across the wafer while switching the beam on and off in a controlled manner [column 7, lines 36-62]. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Fuglevand's apparatus and include each differential amplifier having a plurality of laser wafer trimmed resistors providing matching as disclosed by Fujimoto in order to have amplifier 32 yield the analog output level required by the customer.

As to claim 5, the plurality of cells have a cumulative maximum voltage of about 270 volts: it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide a selection for the cumulative maximum voltage, since it has been held that discovering an "optimum" or "preferred" value for a result effective variable involves only routine skill in the art. See *In re Leshin*, 125 USPQ 416. *In re Aller*, 105 USPQ 233 (CCPA 1955), *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

As to claim 6, each cell has a maximum voltage of about +/-300 volts: it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide a selection for the maximum cell voltage, since it has been held that discovering an "optimum" or "preferred" value for a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

As to claim 7: wherein said differential amplifiers each produce an output such that the voltage of a cell being measured is determined with an error of about 0.02 percent or less, absent any criticality, is only considered to be the use of "optimum" error for the differential amplifiers output that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See also **MPEP 2144.05** statement with regard to "**obviousness of ranges**".

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As to claim 8: wherein said differential amplifiers each produce an output such that the voltage of a cell being measured is determined with a gain nonlinearity error of about 3 parts per million or less, absent any criticality, is only considered to be the use of "optimum" error for the differential amplifiers output that one having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation, since the courts have held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See also **MPEP 2144.05** statement with regard to "**obviousness of ranges**".

As to claim 9, Fuglevand discloses a single housing 12, wherein each system component is housed therein [see column 3, line 56]:

Referring to FIG. 1, one configuration of a fuel cell power system 10 is illustrated. The depicted configuration of fuel cell power system 10 is exemplary and other configurations are possible. As shown, fuel cell power system 10 includes a housing 12 provided about a plurality of fuel cell cartridges 14. Housing 12 defines a subrack assembly in the described embodiment.

As to claim 10, Fuglevand discloses 12 modules with 4 fuel cells. As to wherein each single housing and system component housed therein comprises a module for monitoring the voltage of least 16 cells, and further comprising at least 16 of the modules configured to monitor cell voltages of least 256 cells of a single cell stack, absent any criticality, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide a selection for the number of modules and cells/module in order to obtain the cumulative maximum voltage, since it has been held that discovering an "optimum" or "preferred" value for a result effective variable involves only routine skill in the art. See *In re Leshin*, 125 USPQ 416. *In re Aller*, 105 USPQ 233 (CCPA 1955), *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

As to claims 11, 13 Fuglevand discloses controller 30

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(55) Referring to FIG. 5, one configuration of control system 30 is illustrated. In the depicted arrangement, control system 30 includes a distributed control system including a plurality of controllers 100-120. Individual controllers 100-120 comprise programmable microcontrollers in the described embodiment. Exemplary microcontrollers have trade designation MC68HC705P6A available from Motorola, Inc. In the described embodiment, controllers 100-120 individually comprise a controller configured to execute instructions provided within executable code. In an alternative configuration, the steps described with reference to FIGS. 16-28 below are implemented within hardware.

As to the limitation of having a calculating means, connected to the output of one of the analog to digital converters and the controller, to calculate the at least one cell voltage based on the digital values, it is an inherent function of the micro(controller)processor to include a calculating means, and MPEP 2100 states that the disclosure of a limitation may be expressed, implicit or **inherent**.

As to claim 12, the statement following "**adapted to**" is ambiguous, and MPEP 2106 states that "Language that suggests or makes optional but does not require steps to be performed or does not limit a claim to a particular structure does not limit the scope of a claim or claim limitation may raise a question as to the limiting effect of the language in a claim". Further, it has been held that the recitation that an element is "adapted to" perform a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchison*, 69 USPQ 138.

As to claim 14, the controller being connected to a computer: Fuglevand discloses

Fuel cell power system 10 is shown coupled with a remote device 24. Fuel cell power system 10 is preferably configured to communicate with remote device 24. An exemplary remote device 24 comprises an off-site control and monitoring station. Fuel cell power system 10 receives communications from remote device 24 which may comprise data and commands. Fuel cell power system 10 is also configured to output data, requests, etc. to remote device 24.

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where the remote device 24 performs the following functions:

I Following a start-up condition either inputted via interface or from remote device 24, control system 30 selectively controls switching device 38 to couple power bus 60 with positive terminal 62. Switching device 38 can comprise parallel MOSFET switches to selectively couple power bus 60 with an external load 22.

§ Referring to FIG. 23, a flow chart illustrating exemplary operations of external port slave controller 110 is illustrated. Initially, slave controller 110 performs a communications check with master controller 100 at step S260. Thereafter, slave controller 100 reads any input communication from remote device 24 and communication port 36. At step S264, slave controller 110 sends any received communications to master controller 100. At step S266, slave controller 110 receives any communications from master controller 100. Slave controller 110 proceeds to forward any communications to communication port 36 and remote device 24 at step S268.

↖ Control system 30 is also coupled with communication port 36 providing communications to an external device such as a remote device 24. An exemplary remote device 24 comprises an external control system or monitoring system off-site from fuel cell power system 10. Control system 30 can output data including requests, commands, operational conditions, etc., of fuel cell power system 10 using communication port 36. In addition, control system 30 can receive data including commands, requests, etc., from remote device 24 using communication port 36.

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I Referring to FIGS. 24-24A, a flow chart illustrating exemplary operations of system slave controller 112 is shown. Initially, at step S270, slave controller 112 performs a communications check with master controller 100. Next, slave controller 112 can read status information from power supply sensors 31 and current sensor 40 at step S272. At step S274, it is determined by slave controller 112 whether the inputted status values are within appropriate ranges. If not, slave controller 112 can generate an error message at step S276 for application to master controller 100.

Therefore, it is an inherent function of the offsite control and monitoring station disclosed by Fuglevand to include a computer, and MPEP 2100 states that the disclosure of a limitation may be expressed, implicit or **inherent**.

As to claims 15-17, 20, 22-34, see remarks and references above.

As to the method claims 35-38, 41-49: the method steps will be met during the normal operation of the apparatus described above.

Response to Arguments

7. Applicant's arguments with respect to the claims have been considered but are moot in view of the new grounds of rejection and the revisions of independent claims 1, 15, 26, 35 as indicated above.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing

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date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Lacy [6313750] discloses a divider network adapted coupled to fuel cells of a fuel cell stack and providing pairs of signals. Each pair of signals is associated with a different fuel cell and indicates a terminal voltage of the associated cell and another voltage common to the pair of signals. The memory stores indications of different common mode gains, and each common mode gain indication is associated with a different one of the pairs of signals. The circuit is coupled to the memory and adapted to generate an indication of the terminal voltage from each pair based on the associated **common mode gain indication**. The prior art cited in PTO-892 and not mentioned above disclose related apparatus:

JP 2000092732 discloses a METHOD FOR JUDGING (VOLTAGE) SCATTERING OF BATTERY PACK AND BATTERY DEVICE including a number of unit cells 2 connected in series for composing a battery pack 3; a voltage detection circuit 4 consisting of a differential amplifier 10 for detecting the voltage of each unit cell 2, a multiplexer 11, and an AD converter 12. In each unit cell 2, a discharge circuit 5 with a discharge resistor 15 is provided. A control device 7 detects the SOC of the entire battery pack 3 according to the detection of a current sensor 6, obtains the OCV of each unit cell 2 based on the voltage of each unit cell 2 at that time, obtains the SOC according to the OCV of each unit cell 2 when the change rate of the OCV of each unit cell 2 corresponding to the change of the SOC of the entire battery pack 3 exceeds a specific value, and judges scattering. The unit cell with a large scattering of the SOC is discharged for correcting the scattering.

Masse et al. [20020180447] discloses in figures 1-3b a system for monitoring a plurality of cell voltages 38-44 of an electrochemical device 13 for a plurality of cells connected in series including a controller 26 connected to PC 28 [see fig.2].

James[6140820] discloses in fig.1 voltage regulators 26 to furnish operating power to the voltage scanning units 24. In this manner, each voltage regulator 26 provides one or more regulated supply voltages (via power supply line(s) 27) to a different one of the voltage scanning units 24. The ground of

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each voltage regulator 26 is connected to the same ground as the voltage scanning unit 24 to which the voltage regulator 26 supplies power [column 3, lines 30-35].

James [6281684] discloses a technique and apparatus to measure cell voltages of a fuel cell stack using different ground references including differential amplifier 40 that may be an operational amplifier that is capable of receiving a common mode voltage at either input terminal up to one hundred volts, and the ground of the differential amplifier may be coupled to the stack ground instead of to one of the nodes of the stack.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Pia Tibbits whose telephone number is 571-272-2086. If unavailable, contact the Supervisory Patent Examiner Karl Easthom whose telephone number is 571-272-1989. The Technology Center Fax number is 571-273-8300.

9. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PFT

August 30, 2006

Pia Tibbits

Primary Patent Examiner

